FIG. 4 shows the relation between the master pressure controlled by the fluid pressure control device contained in the above brake device, and the assistance power (the target pressure difference).

FIG. 5 is a flow chart which shows the multi-mode failure detection routine that is stored in the ROM of the above fluid pressure control device.

FIG. 6 is a figure which shows the relations between the brake operating power and the master pressure in the above brake device.

FIG. 7 is a flow chart which shows the failure related brake pressure control routine that is stored in the ROM of the above fluid pressure control device.

FIG. 8 is a flow chart which shows the normal brake pressure control routine stored in the ROM of the above fluid pressure control device.

FIG. 9 shows the relation between the operation power and the master pressure of the brake pedal in the above brake device.

FIG. 10 shows the operation power and the condition of the change in the master pressure when large amount of fluid leakage failure is detected in the above brake device, respectively.

FIG. 11 shows the operation power and the condition of the change in the master pressure when a small amount fluid leak failure is detected in the above brake device, respectively.

FIG. 12 shows the operation power and the stroke, the booster pressure and the condition of the change in each fluid pressure of two pressure chambers of the master cylinder when the bottoming condition occurred in the above brake device, respectively.

FIG. 13 shows the master pressure and the changing condition of the operation power in the above brake device when the servo function failure occurred during the brake operation.

FIG. 14 is a flow chart which shows the multi-mode failure detection routine that is stored in the ROM of the fluid pressure control device contained in the brake device in another embodiment of this invention.

Please replace paragraph [0010] as follows:

[0010] A brake pedal 10, which functions as a brake operating member, is connected to a master cylinder 14 through a vacuum booster (hereafter abbreviated to "booster") 12 in FIG. 1. The master cylinder 14 is of the tandem type, in which two pressure

pistons 14a and 14b engaged with each other in series can slide, and two pressure chambers 14c and 14d are formed by each other independently in the housing in the front of each pressure piston. The master cylinder 14 generates an equal fluid pressure in each of the pressure chambers mechanically, corresponding to the brake operating power which is the pedal power of the brake pedal 10. The brake device in this embodiment is a two system-type brake.

Please replace paragraph [0011] as follows:

[0011]   The detailed explanation of the booster 12 is omitted because it is a common device, which comprises a vacuum chamber 12a connected to a surge tank (the air intake side of the combustion chamber of the engine) and a pressure chamber 12b connected to the vacuum chamber 12a or to the atmosphere depending on the brake pedal 10 operation. This pressure difference does not increase any more after the pressure of the pressure chamber 12b increases to the atmospheric pressure even if the brake pedal 10 is operated further. The condition when the pressure of the pressure chamber 12b reaches the atmosphere, is the limitation point of the brake power assistance, and the fluid pressure of the master cylinder 14 when the booster 12 reaches the limitation point of the brake power assistance is the limitation pressure of the brake power assistance.

Please replace paragraph [0031] as follows:

[0031]   The brake power characteristic control means that the brake power characteristic which has the relation between the brake operating power and the vehicle deceleration is controlled so as to increase the vehicle deceleration in the same proportion of the brake operating power in spite of a decrease in the power of the booster 12. It can be referred to as the brake power assist control because it can assist the brake power when the booster 12 reaches the limitation point of the brake. It also can be referred to as the servo power control, because the servo ratio is controlled.

Please replace paragraph [0045] as follows:

[0045]   In this embodiment, the first predetermined operation power F0 is decided based on, for example, the set load of the return spring 15a, 15b which is contained in the booster 12 and the master cylinder 14, etc. When the brake device is in the normal condition,

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the first predetermined fluid pressure Pth1 is made a smaller value than the master pressure at the time that the operation power is the first predetermined operation power F0. The normal condition includes the case that a small amount of fluid leakage is occurring.

Please replace paragraph [0046] as follows:

[0046] When the booster 12 is in the normal condition, the brake operating power and the assistance power of the booster 12 are added to the output member 11 (see FIG 1A) in the booster 12, and the output of the output member 11 is added to the pressure piston 14b in the master cylinder 14. In the booster 12, if the brake operating power added to the input member 13 through the brake pedal 10 becomes larger than the power based on the set load of the return spring 15b of the input member 13, the input member is moved against the power of the return spring, the control valve is placed in the operating condition, and the power piston generates the assistance power. In the master cylinder 14, if the output power added to the pressure piston 14b becomes bigger than the power based on the set load of the return spring of the master cylinder 14, the pressure piston is moved against the power of the return spring 15b, and the fluid pressure is generated in the pressure chamber.

Please replace paragraph [0048] as follows:

[0048] Clearly by the above explanation, when the booster 12 is in the normal condition, if the power added to the pressure piston (the brake operation power by the driver and assistance power by the booster 12) is beyond the set load of the return spring of the master cylinder 14 (F0', FIG. 9), the fluid pressure is generated in the pressure chamber, and in the case of the servo function failure, while the power (the brake operated power) added to the pressure piston is smaller than the set load of the return spring of the master cylinder 14, the fluid pressure is not generated in the pressure chamber. Therefore, if the value between these powers is determined to be the first predetermined operation power F0, and the first predetermined fluid pressure Pth1 is determined to be a smaller value from the master cylinder pressure in the brake device of the normal condition, failure of the booster 12 and a large amount of fluid leakage can be detected surely based on whether the detected master pressure is greater than the first predetermined fluid pressure Pth1 or not. The first predetermined operation power F0 and the first predetermined fluid pressure Pth1 can be

referred to as the servo function failure judgment operation power and the servo function failure judgment fluid pressure, respectively.

Please replace paragraph [0051] as follows:

[0051]   The bottoming condition is the condition in which, in the master cylinder 14, (1) the front pressure piston 14a of the two pressure pistons is contacted to the stopper 19 of the master cylinder 14 (it also may be the bottom part of the master cylinder), (2) the rear pressure piston 14b is contacted to the front pressure piston 14a, or (3) both conditions (1) and (2) occur (the front pressure piston 14a is contacted to the master cylinder and the rear pressure piston 14b is contacted to the front piston 14a).

Please replace paragraph [0055] as follows:

[0055]   As shown in (a) of FIG. 12, when the bottoming condition occurs (when either of ① -③ occurs), the operating power becomes large rapidly. The reaction power added to the pressure piston corresponding to the operating power becomes large, but if the master pressure becomes small rapidly because of the bottoming condition, it is common that the operation power is increased rapidly by the driver. Therefore, when the increasing gradient of the operation power is larger than the predetermined increasing gradient, the bottoming condition can be detected. In addition, the bottoming condition can be detected based on the changing condition of the increasing gradient of the operation power. For example, it can be detected based on whether the increasing gradient of the operation power is larger than the predetermined value, or whether the increasing rate of the increasing gradient is larger than the predetermined ratio.

Please replace paragraph [0056] as follows:

[0056]   As shown in (b) of FIG. 12, when the bottoming condition occurs, the operation gradient of the stroke becomes very small. The amount of the operating stroke of that situation is beyond the amount of the usual brake operation. Therefore, when the amount of the stroke is larger than the predetermined stroke S0 and the changing gradient of the stroke is very small, it can be determined that the bottoming condition has occurred. In addition, this occurrence of the bottoming condition can be detected distinguishably from the

situation in which the driver keeps the operation stroke of the brake pedal 10 constant during the brake operation.

Please replace paragraph [0058] as follows:

[0058]   As shown in (c) of FIG. 12, when the bottoming condition occurs, the pressure of the vacuum chamber 12a of the booster 12 (the booster pressure) approaches the vacuum pressure changed from the approaching the atmospheric pressure even if the operation power added to the brake pedal is on the increasing state. The booster pressure is approached to the atmospheric pressure by the stroke operation of the operation of the brake pedal 10, if the operation stroke is kept at the constant, the booster pressure is approached to the vacuum pressure. In addition, the situation in which the operation stroke is kept at the constant is the situation that the brake operation power is released by the driver, and the bottoming condition can be detected distinguishably from the above situation based on the changing situation of the booster pressure while the brake operation power is increasing.

Please replace paragraph [0060] as follows:

[0060]   As shown in (d) of FIG. 12, in the brake system in which the fluid leakage is not occurring, when the bottoming condition occurs, the master pressure is increased rapidly based on the increasing of the brake operation power. As shown in (e), in the brake system which the fluid leakage is occurring, the master pressure is decreased rapidly. Therefore, if the decreasing gradient of the master pressure is larger than the predetermined decreasing gradient, the bottoming condition can be detected. Also, when the decreasing gradient of the master pressure is larger than the predetermined gradient in the bottoming condition and the amount of the fluid leakage is small, it is not always larger than the predetermined gradient when the amount of the fluid leak is large because, as shown in FIGS. 11 and 12, the master pressure is also very small before the bottoming condition when the amount of the fluid leakage is large.

Please replace paragraph [0070] as follows:

[0070]   If the servo function failure is detected, the judgment of step S51 becomes YES, the brake fluid pressure is controlled by the first compressing device 150 in step S54